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Forest Pest Management
Pacific Northwest Region

FOREST PEST SURVEY

FALL CREEK CORRIDOR

LOWELL RANGER DISTRICT

WILLAMETTE NATIONAL FOREST, OREGON

Forest Pest Survey
Fall Creek Corridor
Lowell Ranger District
Willamette National Forest, Oregon

by

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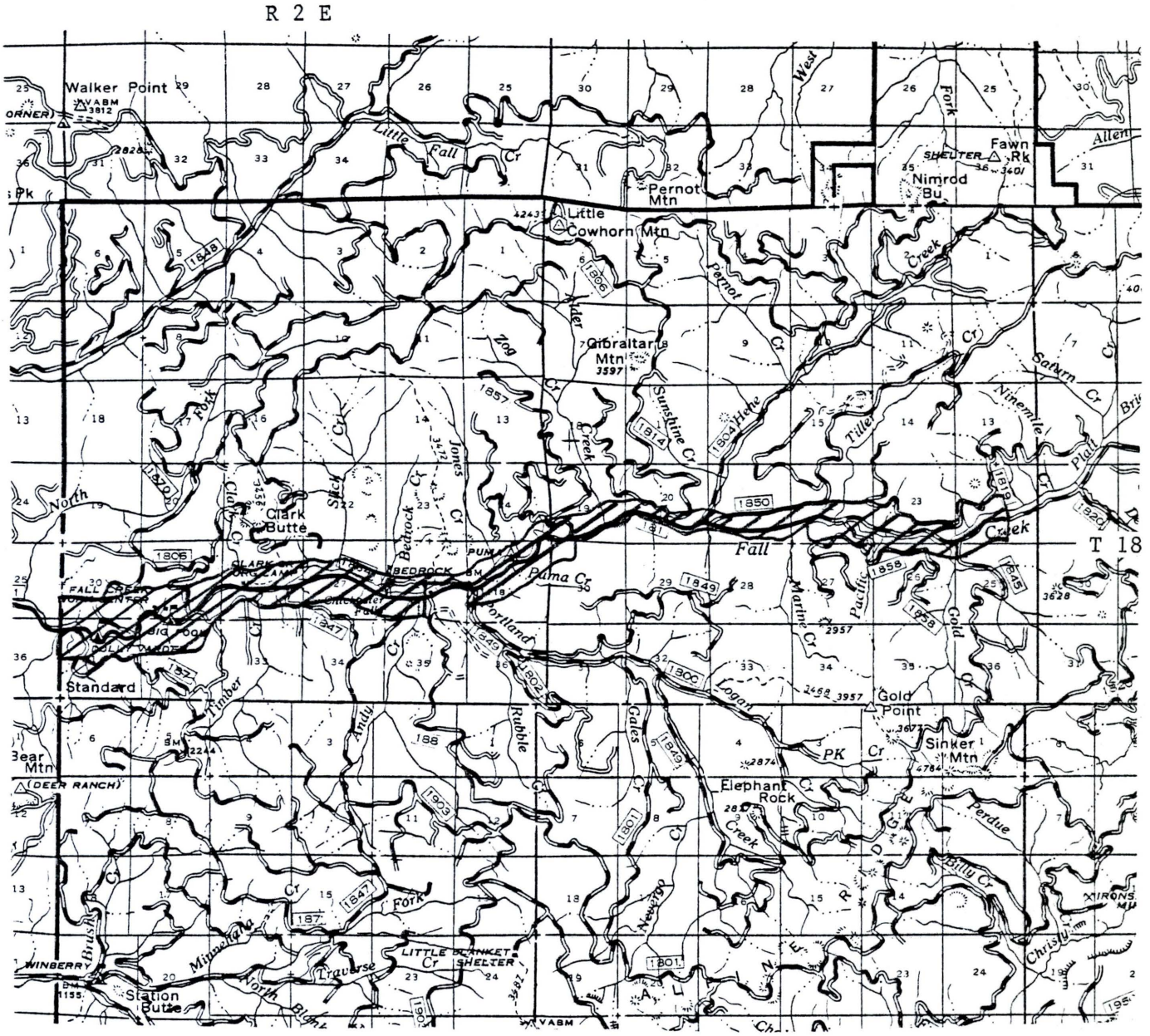
Introduction

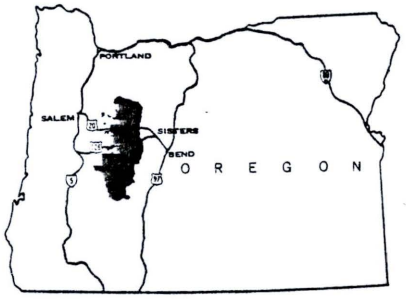
During portions of March through May 1984, Forest Pest Management personnel did a forest pest survey within the Fall Creek Corridor from the Forest boundary east to ½ mile past Gold Creek (T. 18 S., R. 2 E., secs. 24, 25, 26, 27, 28, 29, 30, 31, and 32; T. 18 S., R. 3 E., secs. 19, 20, 21, 22, 23, 24, 25, 26, 27, and 30). The area examined extended up to 20 chains (1320 feet) north and south of Fall Creek (Figure 1). Purposes of the evaluation were to determine causes and amount of pest losses, identify and map problem areas, and develop management recommendations aimed at minimizing future losses. This information was requested by the District for use in developing management plans and alternatives for the proposed Dipper Timber Sale in this corridor.

Stand Characteristics

Site quality in the Fall Creek Corridor is generally very high. Topography varies from some flat areas and gentle slopes near the river to a predominance of steep to very steep slopes on either side of Fall Creek. The survey area is shown in Figure 2.

A variety of stands is present within the survey area. In the western half of the survey area, Douglas-fir makes up >90 percent of the stand component. Going eastward, there is a steady rise in elevation with increasing amounts of western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*) being present. Older stands have a higher component of shade-tolerant species while the youngest stands are pure Douglas-fir. Hardwoods, including bigleaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and black cottonwood (*Populus trichocarpa*), are common throughout. Minor species encountered included incense cedar (*Libocedrus decurrens*), grand fir (*Abies grandis*), and sugar pine (*Pinus lambertiana*). A variety of age classes can be found, yet old-growth timber predominates.





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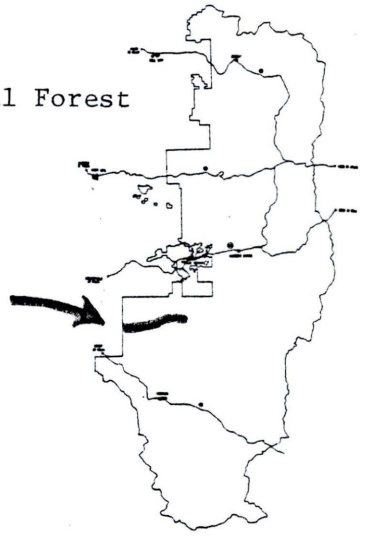

Figure 1. Map depicting location (crosshatching) Of the survey area, Lowell Ranger District, Willamette National Forest.

Stands in the westernmost 2 to 3 miles, especially on the side north of Fall Creek, are youngest, being in the 80- to 120-year-old age class. Most stands in the survey area are of natural origin. One exception is a large plantation resulting from an early clearcut between Timber Creek and Chichester Falls. Almost no recent regeneration type cutting has taken place near the river.

Some timber harvesting has occurred throughout portions of the survey corridor. It has been primarily restricted to salvage or light partial removal cutting where tractor yarding is possible and for a limited distance above and below roads. It is apparent that most salvaging was mainly to capture windthrow and/or root disease-caused mortality.

Methods

The area examined included lands on either side of the river. Private ownerships were not surveyed. Several campgrounds in the corridor were more intensively examined than the remainder of the survey, and findings are documented in letters under 3400, Forest Pest Management, dated March 22 and May 31.

An approximate 3-mile stretch of land on the south side of Fall Creek (T. 18 S., R. 3 E., secs. 19, 20, 21, 22, and 30) was not surveyed due to time constraints, poor accessibility, and very steep terrain.

Transects were run at 10-chain (660 ft.) intervals on either side of Fall Creek for up to 20 chains (1320 ft.). Shorter lines were run when plantations or very steep terrain (>100%) were encountered. The survey area was scrutinized at 50- to 60-percent coverage for root diseases. This was done by reconnoitering a 2½-to 3-chain wide strip on either side of the line. Root disease centers were mapped with boundaries based on the furthermost extent of dead or symptomatic trees. Attempts were made to approximate closely the extent of root disease centers that extended beyond the regularly reconnoitered strip between transects. This information was used to make a composite map of the entire area. The eastern extent of the survey was reached on the south side when root disease-susceptible Douglas-fir (*Pseudotsuga menziesii*) dropped to less than 10 percent of the stand composition due to exposure and elevation. On the north side of the river at that point, Douglas-fir remained the dominant stand component, and disease was still being encountered, but the survey was terminated due to time constraints.

Approximately 2970 acres were surveyed systematically using a variable radius plot method. Plots were placed at 10-chain (660 ft.) intervals along lines. A Spiegal-Relaskop was used to define each plot, and a basal area factor (BAF) of 40 was used.

Each plot was examined for evidence of disease or insect infestation. This included dead and dying trees, old stubs and stumps, and less than normal stocking. Dead trees and trees exhibiting symptoms of root diseases were examined to determine the causal pest. This involved (a) removing a section of bark from the boles of dead trees to check for bark beetles or their galleries, and (b) removing a section of bark on one or more sides of the root collar and exposing and dissecting portions of two or more large roots to check for stained wood or mycelium of root disease fungi. In plots containing root

disease or insect infestation, the following data were recorded for each tree in the plot: tree species, DBH, general condition (live, dead, standing, down), and presence of insects and diseases. Similar data were collected for every tenth plot throughout the survey regardless of the health of the trees on that plot. From this information, mean basal area and number of trees per acre by tree species, DBH class, condition, and pests were calculated.

Results and Discussion

Mean basal areas and number of trees per acre are shown in Tables 1 and 2. Percentage of trees dead due to all causes is 5.8 percent for Douglas-fir, 1.7 percent for western hemlock, and 0.0 percent for western redcedar. Most mortality was due to root rot, especially laminated root rot, caused by *Phellinus (Poria) weirii*. Several other diseases caused lesser amounts of loss. These include Armillaria root rot, caused by *Armillaria mellea*, and brown cubical butt rot, caused by *Phaeolus (Polyporus) schweinitzii*. Some windthrow not associated with root rot was encountered. Most appeared to be rather recent, probably resulting from winter (1983-1984) storms. Trees and basal area per acre by condition and diameter class are shown in Table 2.

Laminated root rot was the most frequently encountered mortality-causing disease throughout the survey area. Over 11 percent of the variable radius plots had at least one tree with this disease. Locations of laminated root rot centers are shown in Figure 2. A total of 460 acres (15.5 percent of total area) was in laminated root rot centers.

Laminated root rot centers contain a large proportion of live trees identified as being infected. Plot data indicate that the number and basal area of living, infected trees approaches number and basal area of dead infected trees. Many other susceptible trees within or on the periphery of infection centers are probably infected, yet have not started to exhibit crown symptoms; they are not identified as infected in the survey. Based on recent studies done in British Columbia and eastern Washington, we suspect that only 50 percent of the number of trees actually infected produced crown symptoms. In older stands and in the eastern portions of the survey area, less root disease-susceptible, shade-tolerant species such as western hemlock, western redcedar, and an occasional incense cedar are more prevalent. In these areas, the occurrence of these species has minimized stocking reduction and probably disease spread.

In older stands with a large component of these species, laminated root rot was often difficult to recognize because the disease centers are fully stocked with hemlock and cedars. Close examination will sometimes yield evidence of long-dead Douglas-firs.

Armillaria root rot was found in the survey area. Most damage was to single trees or small centers of 2 to 3 trees. Both western hemlock and Douglas-fir were found being affected by this disease. Mode of action, levels of loss, and condition of trees being attacked all are characteristics of *A. mellea* acting as a passive pathogen. Some strains of this fungus are extremely virulent and cause extensive mortality. This condition was not observed during this survey.

In the old-growth stands north of Pacific Creek, Armillaria root rot was commonly found infecting scattered, single mature-overmature western hemlock. Almost no Armillaria root rot was identified in cruise plots. Location of the largest centers are shown in Figure 2.

Annosus root rot, caused by *Fomes annosus*, was found in several stands attacking single trees, and in some cases, groups of up to several trees. It was not identified in any cruise plots. Annosus root rot resulted in decline and death, most often predisposing trees to windthrow. Western hemlock was the most common host, and a few Douglas-fir were found infected. Damage was most significant in older stands that contained a large component of western hemlock that had some partial cutting in the past. Most mortality and decay was directly associated with old wounds. Tree wounding was especially common in stands that had been tractor-yarded in several salvage entries, often to remove dead and dying Douglas-fir with laminated root rot. Several multitree centers are identified in Figure 2.

Brown cubical butt rot, caused by *P. schweinitzii*, was found on 0.8 percent of the total Douglas-fir basal area. This is probably a considerable underestimate because this disease is not recognized unless the fruiting bodies are seen or the distinctive decay observed on dead trees. No living infected trees were identified in the cruise, however, only on plots (1 in 10) where all trees were tallied (18) and DBH measured, would fruiting bodies have likely been seen.

Occurrence of brown cubical rot was widely scattered and usually could be identified on individual or small groups of 2 to 3 trees. Several small centers were identified and indicated on Figure 2.

Several other pests were found at relatively low levels of incidence and currently are not causing significant losses. Black stain root disease, caused by *Ceratocystis wageneri*, is a serious disease in some young Douglas-fir stands in the Northwest. Most serious disease problems have been found in precommercially thinned 15- to 25-year-old plantations that are on sites tractor-yarded in the past. In the Fall Creek Survey Area, two trees were found with this disease.

Red ring rot, caused by *Phellinus (Fomes) pini*, was widely observed although at low levels of incidence throughout the survey area. This disease attacks several conifer species. Damage can be significant in West Side Douglas-fir stands. Infection rates and amount of decay usually increase with stand age.

The Douglas-fir bark beetle *(Dendroctonus pseudotsugae)* has caused scattered mortality to its host in some of the older stands. Usually dead, dying, or weakened trees are hit. Trees affected by root disease will often become infested by beetles. Windthrown trees are usually attacked by beetles, and if large quantities of susceptible material are available, population buildup can occur, resulting in insects attacking and killing healthy trees.

Disease Biology and Identification

Laminated Root Rot

Laminated root rot is a common disease in Pacific Northwest Region stands. It primarily causes tree mortality and continuing loss of productivity within disease centers. Growth loss of infected trees also occurs.

Variability in species susceptibility exists in western Oregon mixed-conifer stands. The most susceptible species occurring in the survey area are Douglas-fir and grand fir. Western hemlock is intermediately susceptible. Tolerant species include sugar pine. While western white pine (*Pinus monticola*) was not seen in the area, it could be grown on many of the sites and it is also tolerant to laminated root rot. Incense cedar and western redcedar are resistant, and all hardwood species are immune.

Laminated root rot can be identified from a variety of signs and symptoms. The disease usually causes patches or groups of dead and dying trees in pole-sized or larger stands. Infected trees exhibit crown symptoms including reduced height growth, and thinning and chlorotic foliage. Trees will usually be severely infected before crown symptoms are apparent. Such trees are prone to windthrow. Disease patches usually will appear as pockets of dead and down trees with infected trees exhibiting crown symptoms at the periphery. Less susceptible tree species may proliferate in disease centers, obscuring evidence of laminated root rot. In old-growth stands, laminated root rot may be especially difficult to detect because crown symptoms are usually less apparent in infected older trees, old openings are fully stocked with mature, root disease-tolerant species, and evidence of old mortality is gone.

Current losses in these stands are the highest toward the outer portions of centers where susceptible trees are still present and dying. In some cases, large dying and recent-killed Douglas-fir may be found well in from the active edges of disease centers. These trees usually have been infected for a long time. Regenerating such a site with a susceptible species following a regeneration harvest will result in highest losses occurring near portions of the center where trees were dying or there has been mortality within the last 50 years.

Diseased windthrown trees will frequently exhibit "root balls"; remnants of the root systems that are decayed and broken off just below the root collar. Exposed decayed wood will usually exhibit characteristic delaminations along the annual rings, pitting, and growth of reddish-brown setal hyphae between the sheets of decayed wood (Plate 1).

Living-diseased or recently-killed trees will often have whitish, crusty ectotrophic mycelia of the fungus growing on the surface of infected roots. On larger roots of older trees, this mycelium can usually be found in bark crevices.

P. weirii can survive as a saprophyte for many years on dead host material (large roots and stumps). New infections occur when roots of healthy susceptible trees contact this material. Centers develop when the pathogen grows from diseased trees and infects healthy trees via root contacts or grafts. Laminated root rot can thus remain on the site, infecting subsequent generations.

Disease centers expand as more trees become infected. The rate of expansion can be as much as 1 to 2 feet per year. Stands stocked by less susceptible species may slow the rate of expansion.

In overmature stands, stocking in diseased areas will often have succeeded to a high proportion of shade-tolerant species such as western hemlock and redcedar. After 50 plus years, old infected Douglas-fir root systems will have decayed to the point that they are no longer infective. Infection of more resistant, shade-tolerant trees is much lower. The ability of these trees to infect a subsequent generation of highly susceptible trees such as Douglas-fir is not known but believed to be minimal. Hazard to susceptible regeneration is greatest within a zone around the perimeter of centers where remains of disease-susceptible trees are still present in the soil.

Armillaria Root Rot

Armillaria root rot is found throughout the Northwest on a variety of hosts. In western Oregon, this disease most commonly is found in plantations, especially where offsite stock was planted or local stock was poorly planted. Stressed trees of most species and all age classes are susceptible to attack. Douglas-fir is most susceptible when it is less than 30 years old. Occasionally, virulent strains of this fungus cause mortality to most species and age classes on a site. In some cases, *A. mellea* will be damaging only one species in a stand.

As with laminated root rot, *A. mellea* can cause group mortality. Disease spread is similar, occurring across root contacts or grafts. Infective string-like fungal structures called rhizomorphs can also spread the fungus a short distance through the soil. In most cases, this disease causes scattered mortality. Most often, centers are small.

Crown symptoms caused by Armillaria root rot often include chlorotic foliage and/or a distress cone crop. Resinosis around the base of the bole is very common. Cream-colored mycelial fans are often found growing under the bark of the lower bole on the root collar and roots of infected trees (Plate 2). These can also be found on trees which have been dead for up to 3 years. The presence of rhizomorphs is also very diagnostic.

Annosus Root Rot

Annosus root rot causes decay and mortality in several Northwest timber species. In western Oregon stands, western hemlock is the most common host for this fungus. In western hemlock, the loss due to this fungus is root and butt decay as a direct result of wounds and predisposition to windthrow. In hemlock-fir stands that have been entered more than once, as in salvage operations, decay can be severe if a high percentage of the residual stems are wounded. In stands where wounding has been minimal, loss due to decay and windthrow should be low.

Fomes annosus spreads via airborne spores produced from perennial fruiting bodies. Spores can germinate on fresh wound surfaces on host trees and the fungus then causes decay. Once established in stumps and roots, the mycelium grows along susceptible roots, spreading to adjacent trees across root contacts and grafts.

Black Stain Root Disease

In the Northwest, black stain root disease most commonly causes mortality in young Douglas-fir plantations. Occasionally, older firs will be attacked, as will several other tree species. This disease is most commonly found on sites that have been tractor logged, in stands which have been thinned and along roads, skid trails; sites that have had recent disturbances.

Mortality due to this disease occurs in patches that often show evidence of rapid expansion. Dead standing trees are often present with dying chlorotic trees occurring on the periphery.

This disease is a vascular wilt rather than a root rot. Initial infection is believed to be caused by fungal transmission by several species of bark beetles and weevils that feed on roots. Following infection, disease spreads from tree to tree via root contacts. Following host death, the fungus dies.

Black stain disease can be identified by cutting into the roots and root collar and finding the black- to chocolate-brown-colored stain in the sapwood.

Red-brown Butt Rot

Red-brown butt rot is common in mature to old-growth Douglas-fir. It causes a decay of the root system and butt of its host. The pathogen is usually not very aggressive, and tree decline is slow following infection. Tree mortality usually results from windbreak or windthrow as a result of the decay. One or more other pests may be associated with mortality.

This disease commonly occurs at endemic levels in mature to overmature Douglas-fir stands. Special control measures are seldom required. Reinfection of new stands following harvest and regeneration does not appear to be a problem. Root contacts are probably the primary cause of spread within stands. Most infection centers include only a few trees.

The presence of "velvet-top" fruiting bodies are the best indicators of the disease. Trees which have "wind-broke" will exhibit the characteristic brown cubical rot caused by the fungus.

Red-ring Rot

Red-ring rot is a stem decay found in many conifer species. Individual trees will often have extensive decay throughout the bole. Losses increase with stand age, both as a result of number of trees infected and the amount of decay within each tree. Wood with advanced decay retains some structural strength and currently has some uses such as plywood core. Infected trees can be identified by the presence of fruiting bodies, and in many cases, swollen "punky knots." Spread of disease is by airborne spores infecting trees through branch stubs and possibly wounds.

Plate 1. Laminated decay and setal hyphae characteristic of *Phellinus weirii*

Plate 2. Mycelial fans characteristic of *Armillaria mellea*

Bark Beetles

Various bark beetles have different host selection/attack strategies. The Douglas-fir beetle is an opportunistic insect, attacking and breeding in diseased, injured, or windthrown trees. It is seldom a primary tree killer under endemic population levels. A large amount of susceptible host material can allow the population to increase; subsequently, nearby healthy trees may be attacked.

Alternatives and Management Recommendations

Several diseases and insects are causing significant losses in the Fall Creek Corridor. Most pest losses can be minimized through stand management. This includes maintaining stand vigor through stocking control, species manipulation, and length of rotation. Implementing these management activities must follow consideration of impacts and benefits to other resources. Oftentimes, some degree of current and future losses must be accepted when other resource considerations limit implementation of disease management strategies.

The most serious pest problems in the surveyed area are root diseases. Laminated root rot, caused by *Phellinus weirii*, is the most serious and widespread of several root diseases found in the area. In the area surveyed, approximately 15.5 percent of the area is infected with this root disease. Throughout a large portion of the survey area, this disease can be characterized as being severe. Minimizing losses should be a high priority when formulating management direction in Fall Creek.

Deferring treatment in diseased younger stands with a high Douglas-fir component will result in additional yield losses and expansion of root disease centers. If Douglas-fir were grown on untreated diseased sites, yield losses would approach 50 percent by rotation age. Deferring treatment in diseased older stands with fewer susceptible trees will result in smaller direct losses than expected in younger stands.

Current and future losses can be minimized and conversion of diseased areas to a more healthy condition can be achieved by implementing a long-range integrated management scheme.

The following recommendations are suggested.

Laminated Root Rot

In *P. weirii*-infected, young, second-growth Douglas-fir stands, levels of loss should be periodically evaluated to determine whether a shortened rotation is necessary. In mature to overmature stands that are understocked due to disease, a high priority of treatment should be assigned. Regenerating these stands following harvest will require precautions to prevent future losses.

In mature to overmature stands where a large number of resistant species, such as western redcedar and incense cedar, have maintained full stocking in disease centers, treatments should favor enhancement or perpetuation of these species to the exclusion of Douglas-fir.

Laminated root rot can only be effectively treated prior to stand reestablishment. Following clearcut harvest of the existing infected stand, less susceptible species must be planted or infective material must be removed or rendered sterile if disease losses are to be minimized.

Boundaries of disease centers should be identified on the ground prior to logging and immediately after felling. For about 3 to 4 weeks after exposure, a crescent-shaped, red-brown stain usually is present on cut surfaces of infected stumps. Treatment area should extend 50 feet beyond the last symptomatic tree or stump in a center.

The survey map (Figure 2) depicting areas of root disease should be used as a locality map only. Delineation of root disease boundaries on the map is accurate to within one chain near transects and two to three chains between transects. Unit layout crews should be familiar with signs and symptoms of this disease to aid in determining treatment boundaries.

Regenerating less susceptible species within disease centers will minimize future losses. Planting IMMUNE--bigleaf maple , red alder ; RESISTANT--incense cedar, western redcedar; or TOLERANT--sugar pine and western white pine will minimize future losses and perpetuation of infective material in the soil. Following at least a 50-year rotation of such species excluding susceptible species; Douglas-fir could be safely regrown. Western hemlock, a tree intermediately susceptible to *P. weirii*, can be grown in disease centers with minimal loss over a generation, however, some trees may become infected, and a minimal amount of infection hazard may be present following harvest of that stand. As far as stand management is concerned, that hazard is at an acceptably low level.

When susceptible trees such as Douglas-fir are replanted in disease areas, either to satisfy management objectives or lack of alternative species, the site must be treated to avoid unacceptable losses. Stump removal can be accomplished with heavy equipment or explosives. Possible soil disturbance and compaction, soil nutrient drain, and steep topography are drawbacks to stump removal. The use of fumigants directly applied to infected stumps has been used on an experimental basis. Soil fumigation avoids most of the disadvantages of stump removal, however, it may have other unknown disadvantages since the system is still experimental.

Costs for removing or fumigating stumps are high, $600 to $800 per acre. Contact Forest Pest Management for further information.

Salvage harvesting has been frequently practiced in the Fall Creek Corridor. In most cases, salvaging was done to capture laminated root rot-caused mortality. Several problems are associated with this practice. In mixed species stands where hemlock is a significant component, Annosus root rot, as later discussed, can subsequently be quite damaging. Repeated entries also can cause excessive soil compaction, especially if different skid trails are used in each entry. Stocking levels usually drop. Without site preparation, adequate reforestation is not assured. Practicing species manipulation, important in root disease areas, is difficult. Most importantly, salvage cutting does nothing to lessen future disease losses, but rather postpones treating a problem that generally grows in magnitude. To work towards eradicating *P. weirii* from the site, a regeneration harvest is initially needed. Impacts on other resources can be minimized if treatment units are kept small, encompassing the center and buffer, and done in an orderly sequence over a period of time.

Armillaria Root Rot

Throughout the survey area, *A. mellea* was found infecting and killing occasional scattered trees, Douglas-fir and western hemlock, usually in the suppressed or intermediate crown class. As previously described, some western hemlock were being attacked in one locality. Losses to Armillaria root rot are low enough that the disease can be ignored.

If this disease is encountered during stand entries, infected trees should be removed. Reforested sites should be replanted with healthy, local stock and managed to maintain vigor.

Annosus Root Rot

Annosus root rot was most damaging in mixed species stands that had been salvage logged or partially cut in the past. Stands with a large hemlock component that had been tractor logged are especially damaged.

Reducing future losses can be accomplished by minimizing repeated salvage entries and incorporating regeneration harvesting into the management strategy in this area. Where intermediate entries or salvaging are needed, take steps to minimize wounding of leave trees, especially hemlocks. Predesignated skid trails, log-length skidding, and contract penalties for wounding residuals may be effective. Managing hemlock stands on a shorter rotation (<120 years) will minimize decay losses.

Other Pests

Losses to other diseases and insect pests may best be minimized by managing stands on shorter rotations and including intermediate harvests in management plans to capture mortality and maintain vigor. Losses caused by *P. schweinitzii* can be expected to remain high in most overmature stands where Douglas-fir is a major stand component.

Some *C. wageneri*-caused mortality may occur in the future on tractor yarded Douglas-fir plantations. Most incidence of this disease can be traced to soil compaction. Use of low ground pressure or cable equipment in future logging operations on gentle slopes will minimize this hazard.

Table 1: Mean Basal Area (ft^2) and Trees per Acre by Diameter Class, Species and Tree Condition, Fall Creek Corridor.

DBH Class	Douglas-fir				Western Hemlock				Western Redcedar	
	Alive		Dead		Alive		Dead		Alive	
	BA	T/A	BA	T/A	BA	T/A	BA	T/A	BA	T/A
4			0.2	2.3						
6			0.2	1.0						
8			0.4	0.8	4.4	12.7			2.2	6.4
10	4.4	8.2	0.2	0.3					2.2	4.1
12	2.2	2.8			15.6	19.8	0.2	0.3	2.2	2.3
14					2.2	2.1				
16	0.2	0.1								
18	2.4	1.4			2.2	1.3	0.2	0.1		
20	4.6	2.1	0.8	0.4	2.2	1.0	0.4	0.2		
22	4.6	1.8	0.2	0.1	4.4	1.7				
24	2.4	0.8	0.2	0.1	2.2	0.7				
26	2.2	0.6			2.2	0.6			2.2	0.6
28	11.7	2.7	0.4	0.2	4.4	1.0				
30	7.3	1.5			2.2	0.5				
32	11.1	2.0	0.4	0.1	4.4	0.8				
34	4.4	0.7	0.2	0.1						
36	2.2	0.3	0.4	0.1						
38	6.7	1.0	0.6	0.1						
40	4.8	0.6								
42	4.6	0.5	0.4	0.1						
44	6.9	0.6	0.2	0.1						
46	2.2	0.2	0.8	0.1	2.2	0.2				
48	6.9	0.5	0.4	0.1						
50	2.2	0.2	0.4	0.1						
52	2.2	0.2	0.2	0.1						
54	4.4	0.3								
56										
58	4.4	0.2								
60	2.2	0.1								
62	2.2	0.1								
64	2.4	0.1								
66	0.2	0.1								
68										
70										
80	0.2	0.1								
88	2.2	0.1								
Total	114.4	29.7	6.6	5.6	48.6	42.4	0.8	0.6	8.8	13.4

Totals may not sum as indicated due to rounding

Table 2: Mean Basal Area (ft^2) and Trees Per Acre by Pest, Condition, and Diameter Class, Fall Creek Corridor.

DBH Class	Infected Living Trees *Phellinus Weirii*		Infected Dead trees					
			P. weirii		*A. mellea*		*P. schweinitzii*	
	BA	T/A	BA	T/A	BA	T/A	BA	T/A
10			0.2	0.4			0.2	0.4
12							0.2	0.3
16	0.2	0.1						
18	0.2	0.1						
20	0.2	0.1	0.8	0.4				
22	0.2	0.1	0.2	0.1	0.2	0.1		
24	0.2	0.1	0.2	0.1				
28	0.6	0.1	0.4	0.2				
30	0.6	0.1						
32			0.4	0.1				
34			0.2	0.1				
36			0.4	0.1				
38	0.6	0.1	0.4	0.1			0.2	0.1
40	0.4	0.1						
42	0.2	0.1	0.4	0.1				
44	0.2	0.1	0.2	0.1				
46			0.6	0.1			0.4	0.1
48	0.2	0.1	0.4	0.1				
50			0.2	0.1				
52			0.2	0.1				
64	0.2	0.1						
66	0.2	0.1						
80	0.2	0.1						
Totals	4.4	0.9	5.2	1.5	0.2	0.1	1.0	0.7

Totals may not sum as indicated due to rounding

Prepared by: Craig L. Schmitt — 9/19/84
CRAIG L. SCHMITT, Plant Pathologist — Date

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FIGURE 2

FALL CREEK CORRIDOR FOREST PEST SURVEY

LOWELL RANGER DISTRICT

WILLAMETTE NATIONAL FOREST

1984

LEGEND

- SURVEY BOUNDARY
- TRANSECT
- PLOT LOCATION
- ROOT DISEASE CENTER
- LAMINATED ROOT ROT
- ARMILLARIA ROOT ROT
- BROWN CUBICAL BUTT ROT
- OTHER